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REVIEW ARTICLE

Role of IgE in Eosinophilic Otitis Media

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ABSTRACT
Eosinophilic otitis media (EOM) is an intractable otitis media characterized by the presence of a highly viscous yellow effusion containing eosinophils. It mainly occurs in patients with bronchial asthma and is resistant to conventional treatments for otitis media. Here we discuss the role of IgE in the pathogenesis of EOM. In middle ear effusion, a significantly higher IgE level was detected in EOM patients than in control patients with common otitis media with effusion. This IgE level was significantly higher (about 10 fold) than the serum IgE level. In addition, many IgE-immunopositive cells were found in the middle ear mucosa. The IgE staining was mainly observed on mast cell surfaces, but also partially in the cytoplasm of cells that appeared to be plasma cells. These results suggested that IgE is produced locally in the middle ear mucosa. The existence of high-level IgE may exacerbate eosinophilic inflammation in the middle ear. One of the most distinct characteristics of EOM is the high incidence of sensory hearing loss independent of age. High-tone hearing loss is more frequently found and more severe in EOM patients than in control patients with common chronic otitis media. The concentration of IgE in middle ear effusion significantly and positively correlated with bone conduction hearing levels at 2 kHz and 4 kHz in EOM patients. Overproduction of IgE locally in the middle ear may be related to the pathological condition of EOM and eventually cause inner ear damage.

KEY WORDS
bronchial asthma, eosinophilic otitis media, eosinophils, IgE, sensory hearing loss

INTRODUCTION

Eosinophilic otitis media (EOM) is an intractable otitis media characterized by the presence of a highly viscous yellow effusion containing eosinophils. It mainly occurs in patients with bronchial asthma and is resistant to conventional treatments for otitis media. In 1993, Tomoioka *et al.*[1] first reported on three cases of patients suffering from intractable otitis media associated with bronchial asthma as a new middle ear disease entitiy. They proposed to name this otitis media eosinophilic otitis media (EOM) in 1997.[2] Today, 13 years after the proposal, cases of this disease have accumulated and the clinical characteristics of the disease have become clear. Not only is EOM an intractable and persistent disease, it also presents a high risk of developing severe hearing loss (deafness in some cases).[1-3] The pathological condition of this disease has been demonstrated as active inflammation of the middle ear with production of various chemical mediators that induce migration of eosinophils in the middle ear mucosa.[4-6] In patients with EOM, high concentration of immunoglobulin E (IgE), playing a crucial role in type I allergic reaction, is detected in middle ear effusion. In addition, many IgE-immunopositive cells were found in the middle ear mucosa,[4] indicating that IgE is potentially related to the pathological condition of EOM. In this paper, we discuss the role of IgE in the pathogenesis of EOM.

PATHOGENESIS OF EOM

MECHANISM OF INFILTRATION OF EOSINOPHILS INTO THE MIDDLE EAR

Histological examination of middle ear effusion showed that a large number of eosinophils, which are considered to be eosinophilic mucin, in addition to a mucus component, was observed. Many of these eosinophils are degranulated, and some eosinophils exhibit cytolysis with the nucleus breaking out of the cells (Fig. 1). However, there are not as many eosinophils observed in the middle ear mucosa as in the middle ear effusion (Fig. 2). It is considered that eosinophils that migrated to the middle ear mucosa do not stay locally in the middle ear but migrate immediately to the middle ear cavity. In contrast, nasal

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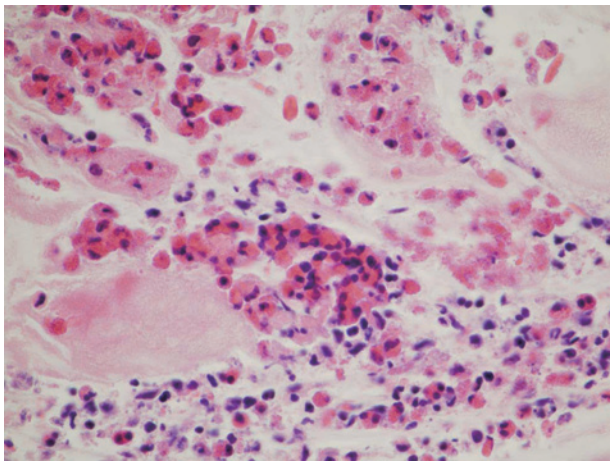

Fig. 1 Histological section of middle ear effusion in a patient with EOM (HE stainings).

polyps and the paranasal sinus mucosa of patients with eosinophilic chronic rhinosinusitis show extensive accumulation of eosinophils in the submucosa (Fig. 3). Therefore, the mechanism of eosinophil migration and survival may be slightly different between middle ear mucosa and paranasal mucosa/nasal polyps.

Eosinophil cationic protein (ECP) is an eosinophil-derived cytoplasmic protein and is a marker for eosinophilic inflammation. The concentration of ECP in the middle ear effusion of EOM patients was significantly higher than that in the control patients with common otitis media with effusion.[4] Moreover, a significantly larger number of EG2-positive cells were observed in the middle ear mucosa of EOM patients than in the control patients, proving that active eosinophilic inflammation is occurring in EOM.[4] Regarding eosinophil chemoattractants, the concentrations of IL-5 and eotaxin in middle ear effusion were significantly higher in EOM patients than in the con-

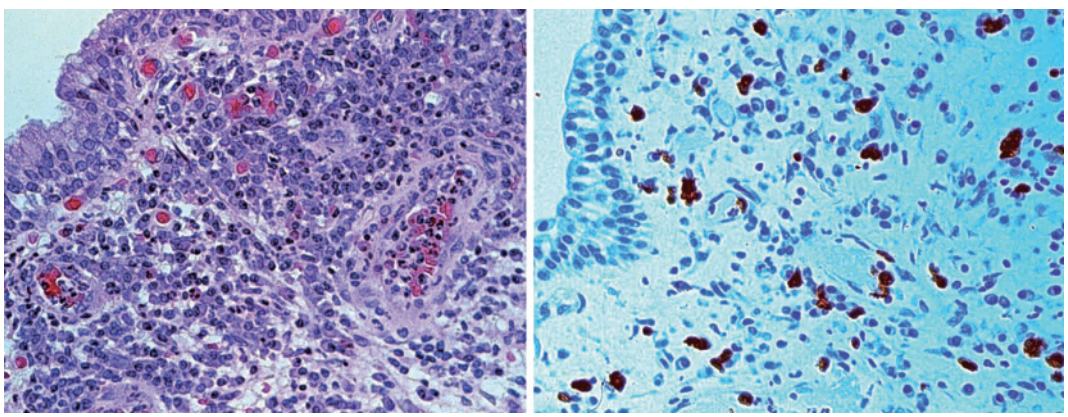

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Fig. 2 Histological and immunohistological sections of middle ear mucosa in a patient with eosinophilic otitis media.

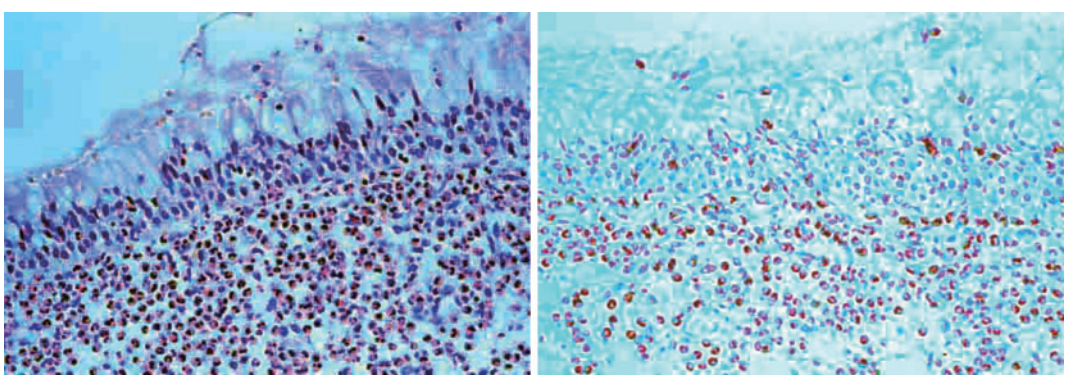

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Fig. 3 Histological and immunohistological sections of paranasal sinus mucosa in a patient with eosinophilic chronic rhinosinusitis.